

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION DIVISION MEMORANDUM

GENERAL SUBJECT: ROADWAY SAFETY FEATURES NUMBER: CD-2001-8
SUPERSEDES: CD-2001-1

SPECIFIC SUBJECT: NCHRP 350 TEST REQUIREMENTS DATE: October 29, 2001

Original w/Signature on file in Construction Division

C. F. GEE
CONSTRUCTION ENGINEER

DIRECTED TO - DISTRICT ADMINISTRATORS

The attached INSTRUCTIONAL AND INFORMATION MEMORANDUM for ROADWAY SAFETY FEATURES dated October 22, 2001 is also CONSTRUCTION DIVISION MEMORANDUM 2001-8.

This memorandum is for your records. Please be guided accordingly.

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C: Mr. Charles D. Nottingham
Mr. Claude D. Garver, Jr.
Mr. Andrew V. Bailey II
Mr. C. F. Gee
Assistant Commissioners
Division Administrators
District Construction Engineers
District Maintenance Engineers
District Materials Engineers
District Equal Opportunity Managers
District Contract Administrators
Resident Engineers
Project Engineers
Project Inspectors
Federal Highway Administration
Virginia Department of Minority Business Enterprise
Virginia Road and Transportation Builders Association
Old Dominion Contractors Association
Virginia Asphalt Association
Virginia Aggregates Association Inc.
American Concrete Pavement Association
Virginia Ready-Mixed Concrete Association
Precast Concrete Association of Virginia

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: ROADWAY SAFETY FEATURES	NUMBER: LD-01 (D) 222.2 TE - 307 CD - 2001 - 8
SPECIFIC SUBJECT: NCHRP 350 TEST REQUIREMENTS	DATE: OCTOBER 22, 2001
	SUPERSEDES: LD-98 (D) 222.1 TE - 304 CD - 2001 - 1
LOCATION AND DESIGN DIVISION APPROVAL: <i>Mohammad Mirshahi, PE</i>	CONSTRUCTION DIVISION APPROVAL: <i>C.F. Gee</i>
TRAFFIC ENGINEERING DIVISION APPROVAL: <i>Ilona O. Kastenhofer</i>	MAINTENANCE DIVISION APPROVAL: <i>D.R. Liston</i>

Changes are shaded.

CURRENT REVISION

- Standard GR-8 (Weak Post) Guardrail and Standard MB-5 Median Barrier (Weak Post) have been revised to meet NCHRP 350 Crash Test Requirements and are approved for use on all classifications of roadways.
- Crash Cushion TL-2 TRACC has been added to the Approved Products List.
- New pay items have been added for revised designs that include "NCHRP 350 TL-3" designations.

EFFECTIVE DATE

These instructions are effective upon receipt.

BACKGROUND

The National Cooperative Highway Research Program (NCHRP) published "Recommended Procedures for the Safety Performance Evaluation of Highway Features" in NCHRP Report 350. As a result of that report, the FHWA issued a requirement that all permanent safety hardware systems included in Federal Aid projects after August 1998 meet NCHRP 350.

VDOT also extended that requirement to state funded projects. A July 25, 1997 memo from FHWA provided additional requirements regarding dates and conditions of compliance. The compliance date (with some exceptions) was extended to October 1, 1998. This memo also divided work zone devices into four categories with explicit requirements for each of the categories, which we will parallel in this document.

- Subsequent to the July 25, 1997 memo, the following have been made available:
 - July 1, 1998 AASHTO-FHWA Agreement
 - August 28, 1998 memo from the Director, Office of Engineering FHWA, "Crash Tested Work Zone Traffic Control Devices"

LONGITUDINAL BARRIER

- Standard GR-8 (Weak Post) Guardrail has been revised to meet NCHRP 350 testing criteria for high speed roadways. When installations of GR-8 Guardrail have been damaged and need repair/replacement, the guardrail should be "upgraded" to the new Std. GR-8.
- Standard GR-2 (Strong Post) Guardrail using a steel post, and blockouts made of wood or composite, have met NCHRP 350 criteria.

Any existing strong post guardrail installations not in accordance with NCHRP 350 criteria should not be repaired or replaced in kind but upgraded to meet NCHRP 350 when damaged or within the limits of a construction project. When damaged, the extent of damage should govern repair/replacement. If the total run of guardrail is 60 meters (200 feet)±, the entire run shall be replaced with strong post (St'd. GR-2) guardrail. For sections of guardrail that are longer than 60 meters (200 feet), if more than 60% of the entire run has been damaged, the entire run shall be replaced with strong post (St'd. GR-2) guardrail. If less than 60% of the entire run has been damaged, the damaged section should be replaced with strong post (St'd. GR-2) guardrail. Standard GR-3 (Cable) Guardrail met NCHRP 350 criteria.

NEW PAY ITEMS

ITEM CODE	DESCRIPTION	ITEM UNIT
13290	Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13292	Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13294	Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13291	Radial Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13293	Radial Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13295	Radial Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13298	Radial Guardrail GR-8C (NCHRP 350 TL-3)	Linear Feet/Meters
13440	Median Barrier MB-5 (NCHRP 350 TL-3)	Linear Feet/Meters
13441	Median Barrier MB-5A (NCHRP 350 TL-3)	Linear Feet/Meters
13442	Median Barrier MB-5B (NCHRP 350 TL-3)	Linear Feet/Meters

GUARDRAIL TERMINALS

- The MELT (Modified Eccentric Loaded Terminal - Standard GR-7) as it appears in the original 1996 Road and Bridge Standards has not passed NCHRP 350 test requirements to the satisfaction of the FHWA and is therefore not allowed for use after October 1, 1998. The new GR-7 with a revision date of 7/98 specifies designs that meet NCHRP 350 which include proprietary products such as the SRT350 and FLEAT350. These products have been approved by the FHWA for use as flared end terminals. If future testing produces additional options, VDOT's Road and Bridge Standards will be revised appropriately.
 - Standard GR-6 Terminal Treatments for W Beam Guardrail is designed to be buried in the cut slope. This terminal design has been revised to meet the NCHRP 350 approved design recommended by FHWA and is furnished as an insertable sheet dated 6/98.
 - Standard GR-9 Alternate To the Flared End Terminal is a parallel terminal design that is used for situations in which the flared terminal (Standard GR-7) cannot be installed due to site restrictions. VDOT's Road and Bridge Standards detail specifies that only products approved in accordance with NCHRP 350 test criteria (such as ET-2000, SKT-350, or BEST 350) are acceptable for use as Standard GR-9.
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IMPACT ATTENUATORS / CRASH CUSHIONS

All designs used for permanent installations of impact attenuators / crash cushions must have FHWA approval letter specifying compliance with NCHRP 350 test requirements. (See attached table)

CONCRETE BARRIER

- Concrete Median Barrier meets NCHRP 350; however, testing has proven that impacts with "F" shape barrier resulted in better vehicle stability than with the "New Jersey" shape, especially for smaller vehicles, due to a reduction in the height of the break between the upper and lower slopes. Therefore, VDOT has required the "F" shape concrete median barrier since the January 2000 advertisement. The Department allowed a transition period before requiring the new "F" shape.
- From the January 1996 advertisement until January 2000, contractors were allowed the option of providing either of two types of concrete barrier, as noted below:
 - "New Jersey" shape or "F" shape *
- Note: "F"-Shape barrier was required on selected projects that required more than 2300 meters (7500 ft.) of barrier or other selected projects when required in contract documents.

BREAKAWAY OR YIELDING SUPPORTS FOR SIGNS AND LUMINAIRES

- Includes items such as wood posts, slip bases, breakaway couplers, frangible bases, etc.
 - The Department uses devices that currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.
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WORK ZONE DEVICES

- CATEGORY 1 DEVICES

- Includes items such as drums, cones, tubular markers, self-erecting delineator posts without any auxiliary device mounted on them except for Type A or C warning lights on drums and ballast located at the base of the devices.

These devices are small and lightweight channelizing and delineating devices that carry virtually no potential to penetrate windshields, cause tire damage or have a significant impact on the control or trajectory of an impacting vehicle. These devices will, however, require certification by the manufacturer that their device is crashworthy – that it meets the evaluation criteria of NCHRP 350 Test Level 3. This certification may be a one-page affidavit signed by the manufacturer. When Type A or C warning lights are used on drums, the certification letter shall indicate that the drum and warning light combination is crashworthy. This certification is required for any device purchased after October 1, 1998 by the Department and Contractors.

- The Contractor shall provide, when applicable, a certification letter indicating that those channelizing devices being used for which no manufacturer certification is being supplied were purchased prior to October 2, 1998.
- All devices used by the Department or Contractors shall conform to NCHRP 350 Test Level 3, beginning January 1, 2003, regardless of the date purchased.

- CATEGORY 2 DEVICES

- Includes Category 1 devices (drums, cones, etc.) with an auxiliary device (warning light except a Type A or C warning light on drums, sign, etc.) mounted on it, portable vertical panel assemblies, portable sign supports, intrusion detectors and alarms, and Type I, II and III Barricades.
- These devices are not expected to produce significant vehicular velocity change, but may otherwise be hazardous by penetrating a windshield, injuring a worker or causing vehicle instability when driven over. The Department has developed an approved list of those devices that comply with NCHRP 350 Test Level 3 and our specifications, and will

maintain it on VDOT's web site. When a device is intended to be used that does not appear on the list and the device was purchased after the applicable date, a copy of the FHWA acceptance letter for complying with NCHRP 350 will be required from the manufacturer prior to utilizing that device. On construction/maintenance projects for devices purchased after the applicable dates, the Contractor will be required to furnish a certification letter indicating those devices he intends to use are on the approved list or FHWA acceptance letters for devices not existing on the Department's approved list. Finally, the Contractor shall provide, when applicable, a certification letter indicating that those channelizing devices being used that are not on the approved list and for which no FHWA acceptance letter is being supplied were purchased prior to the applicable dates.

- Category 1 devices with an auxiliary device attached (except drums with a Type A or C warning light)

These devices shall have been tested with the type of auxiliary device attached for conformance with NCHRP 350, Test Level 3, and an acceptance letter issued by FHWA. This is effective for those devices purchased after October 1, 2000 by the Department and Contractors. However, all Category 1 devices with an auxiliary device attached used by the Department and Contractors shall conform to NCHRP 350, Test Level 3 beginning January 1, 2003, regardless of the date purchased.

- Portable Vertical Panel Assemblies

Portable Vertical Panel Assemblies shall have been tested for conformance with NCHRP 350, Test Level 3, and an acceptance letter issued by the FHWA. This is effective for those portable vertical panel assemblies purchased after October 1, 2000 by the Department and Contractors. However, all vertical panels used by the Department and Contractors shall conform to NCHRP 350, Test Level 3 beginning January 1, 2003, regardless of the date purchased. Portable vertical panel assemblies with an auxiliary device mounted on it shall not be used after October 1, 2000 unless they have been tested and approved under NCHRP 350, Test Level 3.

- Portable Sign Supports

- Tripod Type

Tripod portable sign supports shall no longer be used regardless of the purchase date.

- Self-erecting Type

Self-erecting portable sign supports shall have been tested with the type of sign that is intended to be used with it for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. This is effective for those supports purchased after October 1, 2000 by the Department and Contractors. However, all self-erecting portable sign supports used by the Department and Contractors shall conform to NCHRP 350, Test Level 3 on January 1, 2003, regardless of the date purchased.

- Intrusion Detectors and Alarms

These devices shall have been tested for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. This is effective for devices purchased after October 1, 2000 by the Department and Contractors. However, all intrusion detectors and alarms used by the Department or Contractors shall conform to NCHRP 350, Test Level 3 on January 1, 2003, regardless of the date purchased. Even though these devices are not normally required on projects, the Contractor will be required to furnish a copy of the FHWA acceptance letter if they plan to use such a device.

- Type I and II Barricades

These devices are not used by the Department and therefore will not affect our operations.

- Type III Barricades

These devices shall have been tested for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. This is effective for devices purchased after October 1, 2000 by the Department and Contractors. However, all Type III barricades used by the Department or Contractors shall conform to NCHRP 350, Test Level 3 beginning January 1, 2003 regardless of the date purchased. (The current Standards BD-1 and 2, available as insertable sheets and VDOT's Road and Bridge Standards shall no longer be used.)

- CATEGORY 3 DEVICES

- Includes items such as barriers, crash cushions, fixed sign supports, and truck mounted attenuators.
- These devices can cause significant velocity changes or other potentially harmful reactions to impacting vehicles.
- Concrete Traffic Barrier Service

For **temporary** locations, either "New Jersey" or "F" shape Concrete Traffic Barrier Service may be used until the January 2000 advertisement. After that date, only the "F" shape will be allowed. Whenever the new shape is used in conjunction with a temporary installation, a positive connection (joint that transfers tension and moment from one segment to another) will be required. Beginning with the January 2000 advertisement, all positive connections must be approved in accordance with NCHRP 350.

- Temporary Attenuators/Crash Cushions

These devices shall have been tested for conformance to NCHRP 350 and an acceptance letter issued by the FHWA. This is effective for devices used by the Department beginning January 1, 1999, and for construction/maintenance projects beginning with January, 1999 advertisements. Until January, 1999, devices held in stock were permissible as long as these items met NCHRP 230 and the items are not deficient in any way that would jeopardize safety. Devices purchased after 10/01/98 shall meet NCHRP 350 requirements.

- Fixed Sign Supports

The Department uses wood posts and other supports, which are listed in the Department's Special Products Evaluation List (SPEL), for fixed sign supports. These devices currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.

- Truck Mounted Attenuators

Truck mounted attenuators shall have been tested for conformance to NCHRP 350 and an acceptance letter issued by the FHWA. This is effective for devices purchased after October 1, 1998 by the Department and Contractors. In addition, all new purchases by the Department shall be for units conforming to NCHRP 350, Test Level 3. Existing Central Office purchase orders for the procurement of these devices have already been modified to require the newer unit. However, all truck mounted attenuators used by the Department or Contractors shall conform to NCHRP 350, Test Level 3 on January 1, 2003, regardless of the date purchased. Until the January 1, 2003 deadline, truck mounted attenuators used by both the Department and Contractors may conform to either NCHRP 230 or NCHRP 350 or as otherwise specified by the contract. When existing Department owned NCHRP 230 units are damaged, a cost analysis shall be conducted by the Department to determine whether it is financially feasible to repair the unit. In addition to cost, the time left before the deadline shall be considered in making this determination.

- CATEGORY 4 DEVICES

- Includes portable items, usually trailer-mounted devices such as area lighting supports, arrow boards, portable traffic control signals, and portable changeable message signs.
- The FHWA has determined that time is needed to:
 - conceive and evaluate alternate measures for making these devices crashworthy,
 - examine the use and crash histories of existing devices, review and, if needed, develop safer, cost-effective strategies for the placement or replacement of these devices that will provide motorists needed information for driving in work zones.
- An announcement of an implementation date is anticipated by October 1, 2003.

NCHRP 350 Implementation Dates For Work Zone Devices			
Category:	Devices:	New Devices Purchased After:	Field Compliance Date:
1	Cones, Drums, Drums with a Type A or C Warning Light, Tubular Markers, Self-Erecting Delineators	10/01/1998	01/01/2003 *
2	Category 1 Devices with Auxiliary Devices (Warning Lights except Type A or C Warning Lights on Drums, Signs, etc.)	10/01/2000	10/01/2003 *
	Portable Vertical Panel Assemblies	10/01/2000	01/01/2003 *
	Tripod Type Sign Stands	No Longer Allowed	
	Fixed Sign Supports	These devices currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.	
	Self-Erecting Type Sign Stands	10/01/2000	01/01/2003 *
	Intrusion Alarms and Detectors	10/01/2000	01/01/2003 *
3	Type III Barricades	10/01/2000	01/01/2003 *
	Concrete Barriers (F-shape)	-----	01/01/2000 *
	Work Zone Crash Cushions	10/01/1998	01/01/1999 *
	Truck Mounted Attenuators	10/01/1998	01/01/2003 *
4	Portable, Trailer-Mounted Devices	Announcement of an implementation date is expected by 10/01/2003.	

NOTES: * The Field Compliance Date is the date that these devices have to conform to NCHRP 350 Test Level 3 (TL-3) regardless of the purchase date.

VDOT APPROVED PRODUCTS

For information regarding VDOT approved products in the lists that follow, please contact Engineering Services at (804)786-2543 or refer to the following web site: www.vdot.state.va.us
Click on OPPORTUNITIES NETWORK; Select LOCATION AND DESIGN to view the NCHRP 350 approved products.

CRASH CUSHIONS **(NCHRP 350 Approved)**

ENERGY ABSORPTION SYSTEMS, INC.	TL-1 & TL-2 NEAT Non-Redirective, Guards Precast Traffic Barrier Service Concrete and QMB (CZ only)
	TL-2 QUADGUARD ELITE (7 BAY) Redirective Crash Cushion
	TL-3 QUADGUARD ELITE (11 BAY) Redirective Crash Cushion
	TL-1, TL-2 & TL-3 ENERGITE III Non-Redirective Sand Module (CZ or permanent)
	TL-2 & TL-3 QUADGUARD Redirective Crash Cushion (CZ or permanent)
	TL-3 QUADGUARD-WIDE Redirective Crash Cushion (permanent)
	TL-3 QUADGUARD LMC Low Maintenance Redirective Crash Cushion (permanent)
	TL-3 BRAKEMASTER Redirective Terminal/Crash Cushion (permanent)
ROADWAY SAFETY SERVICE	TL-3 REACT 350 Redirective Crash Cushion (CZ or permanent)
	TL-1, TL-2 & TL-3 FITCH UNIVERSAL MODULE Non-Redirective Sand Module (CZ or permanent)
TRINITY INDUSTRIES SYRO STEEL	TL-3 CAT Redirective Terminal/Crash Cushion (permanent)
	TL-3 ADIEM Redirective Lightweight Concrete Crash Cushion (For use in CZ only)
	TL-2 & TL-3 TRACC Redirective Crash Cushion (CZ or Permanent)
TRAFFIX DEVICES	TL-1, TL-2 & TL-3 BIG SANDY Non-Redirective Sand Module (CZ or permanent)
BARRIER SYSTEMS, INC.	TL-2 & TL-3 ABSORB 350 Non-Redirective Crash Cushion for Precast Traffic Barrier Service Concrete and QMB

TL-1, 30 MPH Max.
TL-2, 45 MPH Max.
TL-3, >45 MPH

Note: CZ refers to Construction Zone
QMB refers to Quickchange Moveable Barrier

TERMINALS
(NCHRP 350 Approved)

INTERSTATE STEEL/ROAD SYSTEMS, INC.	TL-3 BEST 350	VDOT ST'D. GR-9
	TL-3 SEQUENTIAL KINKING TERMINAL (SKT-350)	VDOT ST'D. GR-9
TRINITY INDUSTRIES SYRO STEEL	TL-3 SLOTTED RAIL TERMINAL (SRT-350) for W. Beam Guardrail	VDOT ST'D. GR-7
	TL-3 CAT	VDOT ST'D. GR-9
	TL-3 ET-2000	VDOT ST'D. GR-9
ROAD SYSTEMS, INC.	TL-3 FLARED ENERGY ABSORBING TERMINAL (FLEAT-350)	VDOT ST'D. GR-7
ENERGY ABSORPTION	TL-3 BRAKEMASTER	VDOT ST'D. GR-9

CRASHWORTHY LONGITUDINAL BARRIERS
(NCHRP 350 Approved unless otherwise noted)

AASHTO ROADSIDE DESIGN GUIDE CHAPTER 9	Pin and Loop	NCHRP 230
	Channel Splice	NCHRP 230
	Vertical I-Beam	NCHRP 230
	Lapped Joint	NCHRP 230
	J-Hook Joint	NCHRP 230
BARRIER SYSTEMS, INC.	TL-3 Narrow Quick Change Moveable Barrier	
ENERGY ABSORPTION SYSTEMS	TL-3 Acceptance	
IOWA DOT	TL- 3 Iowa PCB Temporary CMB F-shape with Pin and Loop Connection	
ROCKINGHAM PRECAST	TL-3 Temporary CMB-F shape with Slotted Tube/T-Bar Connection	

**CRASHWORTHY LONGITUDINAL BARRIERS
(NCHRP 350 Approved unless otherwise noted)
-continued-**

SMITH-MIDLAND	TL-3 Temporary Concrete Median Barrier F-shape and New Jersey shape with J-J Hook Connection
VIRGINIA DOT	Temporary Concrete Median Barrier F-shape with Pin and Loop connection
BARRIER SYSTEMS, INC.	TL-3 Quickchange Moveable Barrier (QMB) Moveable Barrier
PENNSYLVANIA DOT	TL-3, 12'-6" Long Temporary Concrete Median Barrier F-Shape with Plate Connection

**PORTABLE VERTICAL PANELS
(NCHRP 350 Approved)**

IMPACT RECOVERY SYSTEM	Vertical Panel
WOUDENBERG ENTERPRISES	Msi Durastem Vertical Panel w/ Lightweight Warning Light
FLASHER HANDLING CORP.	Air Spill Barricade Vertical Panel
BENT MANUFACTURING COMPANY	Vertical Panel w/ Lightweight Warning Light ULTRA Vertical Panel w/ Lightweight Warning Light
WLI INDUSTRIES, INC.	SafetyCade Vertical Panel SafetyCade Extended Vertical Panel w/ Lightweight Warning Light
SERVICE SIGNING, L.C.	Vertical Panel
EASTERN METAL / U.S.A. SIGNS	Melba Vertical Panel

CHANNELIZING DEVICES W/AUXILIARY DEVICES* **(NCHRP 350 Approved)**

FLASHER HANDLING CORP.	Plastic Substrate Sign Panel Mounted on face of Drum.
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* Drums with Type A or C warning lights are acceptable as Category 1 devices and therefore will not be listed in this document.

PORTABLE SIGN SUPPORTS **(NCHRP 350 Approved)**

EASTERN METAL/USA SIGNS	Super Flex Compact Stand w/Fiberglass Leaf Spring C-102, C-132, C-142, C-200, C-202, C-232, C-242, C-802, C-832, C-842, C-902, C-942, X-501, X-550, X-551, X-600 and X-601 Portable Sign Stands w/roll-up signs only.
FLASHER HANDLING CORP.	Bantam 2 portable sign stand, Featherweight 2 sign stand w/roll-up signs.
DICKE TOOL COMPANY	Model Numbers DL1003W, QLV-W, MSRIGID-30, QFV-60, QFV-84, PS-3330, PS-3330-S, DF3003, DF3000S, DF3003W, MSFLEX-30, QFV-48, DF3003S, PS-3000S, DF3000WQ, DF-4700, DF-4700TX, Uniflex 2000 and DL1003WQ w/roll-up signs only.
MARKET DISPLAYS INTERNATIONAL (MDI)	Model Numbers 4814CS, 4814DLK, 4814HDK, 4814SSCK, 30CAM, 40CAM, 4814NSCK, 4884CS, 4860KA, 4850, 4860, 4812, 4818, 4815, 4814K w/roll-up type signs.
KORMAN SIGNS, INC.	Model Numbers SS548UCR, SS548UCRA, SS548UCA, SS548UCR, SS548UC, SS548, SS548A, SS548CA, SS548C, SS548v, SS560, SS560A, SS560UCA, w/roll-up signs only.
TRAFFIX DEVICES, INC.	Big Buster Dual Spring Folding Leg sign stand, Little Buster Dual Spring Folding Leg sign stand, Econo Buster sign stands w/roll-up type signs.
SIGN UP CORPORATION	Model Numbers 1000X, 5000X, X-CELL, MS-2000xi sign stands w/roll-up type signs.

**PORTABLE SIGN SUPPORTS
(NCHRP 350 Approved)
(continued)**

PACIFIC SAFETY SUPPLY, INC.	Model Numbers PS-3330 and PS-3000-S sign stands w/roll-up type signs.
LANG PRODUCTS INTERNATIONAL, INC.	Model Numbers Basic TM 48, Basic TM 48 stand w/SnapFlag TM Dual Warning Flag system, CrossWindTM 204-HD, CrossWindTM 204-HD w/SnapFlag Dual Warning Flag system. All models are to use roll-up type signs.
FLEX-O-LITE SERVICES AND MATERIALS CO.	Model Numbers QLV-W, QFV60, QFV-W, QFV48 sign stands w/roll-up type signs.
BONE SAFETY SIGNS	Model Numbers SZ-412, SZ-412/S, SZ-460, SZ-460/S, SZ-484, SZ-484/S sign stands w/roll-up type signs.

**TYPE III BARRICADES*
(NCHRP 350 Approved)**

BENT MANUFACTURING COMPANY	Type III Barricade
RECYCLED PLASTIC PRODUCTS	Type III Barricade w/ Lightweight Warning Light
FLASHER HANDLING CORP.	Type III Barricade
CANTEL OF MEDFORD, INC.	EZ-UP Type III Barricade
DAVIDSON PLASTICS CORP.	T3B Plastic Type III Barricade
EASTERN METAL/USA SIGNS.	Type III Barricade

* Any Type III Barricade may have roll-up signs attached and still be in compliance with NCHRP 350 requirements.

TRUCK MOUNTED ATTENUATORS *
(NCHRP 350 Approved)

ENERGY ABSORPTION	TL-2 ALPHA 70K TMA TL-3 ALPHA 100K TMA TL-3 SAFE STOP TMA
TRINITY INDUSTRIES SYRO STEEL	TL-2 MPS 350 TMA TL-3 MPS 350 TMA
IMPACT ABSORPTION	TL-3 VANDERBILT TMA
ALBERT UNRATH, INC.	TL-3 U-MAD 100K TMA
TRAFFIX DEVICES, INC.	TL-2 SCORPION A 10,000 TMA TL-3 SCORPION C 10,000 TMA
RENCO, INC.	TL-2 REN-GARD 815 TMA TL-3 RAM 100K TMA

* NOTE: TL-2 TMA's may be used until 01/01/2003.
TL-3 TMA's are required to be used as of 01/01/2003.